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ARMSTRONG LABORATORY

SOURCE EMISSION TESTING OF THE MUNITIONS DEACTIVATION FURNACE, KADENA AIR BASE, OKINAWA, JAPAN

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March 1992

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13. ABSTRACT *(Maximum 200 words)*

Source emission testing for total lead and particulates was conducted on the munitions deactivation furnace located in the 400th Munitions Squadron area of Kadena Air Base, Okinawa, Japan. Test results indicate that if most state or EPA standards were to apply, the munitions incinerator would exceed these standards. Total lead is also high, but there are no appropriate standards in which to compare. Recommendations are made as to the munitions furnace operation.

14 SUBJECT TERMS

Kadena Okinawa Lead Source Emission Testing Particulates

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SOURCE EMISSION TESTING OF THE MUNITIONS DEACTIVATION FURNACE
KADENA AB, OKINAWA, JAPAN

INTRODUCTION

On 24-31 Sep 91, source emission testing for lead and particulate emissions was conducted on the munitions deactivation facility located in the 400th Munitions Maintenance Squadron (MMS) area of Kadena AB. Testing was performed by the Air Quality Function of Armstrong Laboratory. This survey was requested by the Chief, Bioenvironmental Engineering Services, 313th Medical Group (313 Med Gp/SGPB) to gather data necessary to satisfy an Environmental Compliance Assessment and Management Plan (ECAMP) deficiency. Personnel involved with on-site testing are listed in Appendix A.

Site Description

The deactivation furnace is a rotating kiln equipped with a small secondary burner/chamber at one end of the kiln (Fig. 1).

Figure 1. View of 400th MMS munitions deactivation furnace.

The incinerator is equipped with a continuous-feed conveyer which enters the incinerator just below the stack (Fig. 2). Emissions exit via a stack which extends through the roof and to 20.9 ft (6.38 m) above the ground (Fig. 3). Small arms ammunition, that is excess, no longer used, or out of date, is disposed of on a regular basis. Three different types of ammunition were used for the emission test which comprised 3 test runs: 20 mm high-explosive incendiary, 20 mm target tracer, and 7.62 mm and 5.56 mm ball cartridges.

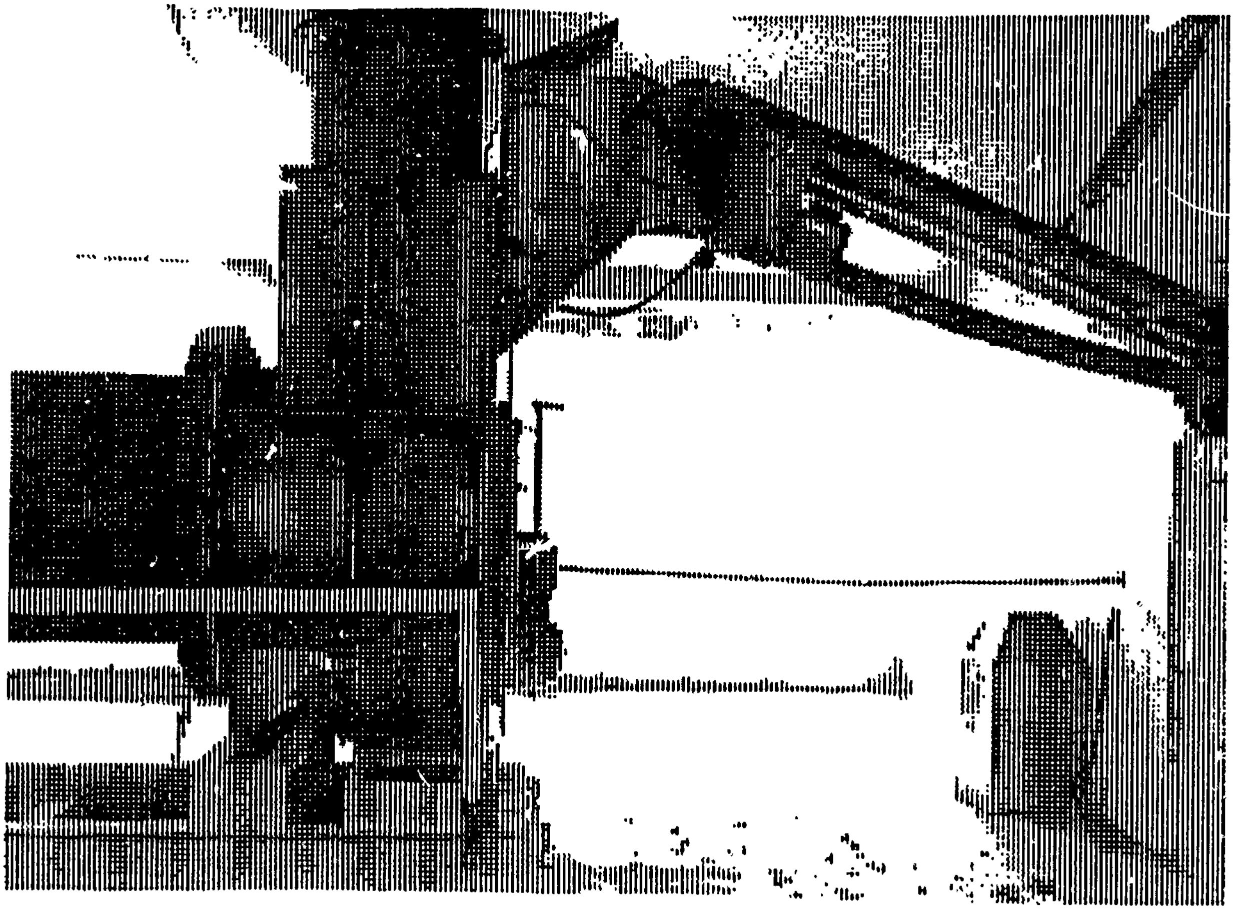

Figure 2. View of conveyer into incinerator.

Applicable Standards and Guidelines

There are no particulate or lead standards for this facility; however, in order to establish a baseline, particulate emission results are compared with Environmental Protection Agency (EPA) new source performance standard (NSPS) for incinerators which is 0.08 grains/dry standard ft^3 (gr/dscf) (1). Emission standards in other states for existing facilities range from a high of 0.10 gr/dscf (229.22 mg/m^3) in Alaska to a low of 0.04 gr/dscf (91.69 mg/m^3) in New York (2). A comparable source standard for lead does not exist; however, the time weighted average-permissible exposure limit (TWA-PEL) for lead, which is 0.15 mg/m^3, can be used to determine the relative risk with the appropriate dispersion model.

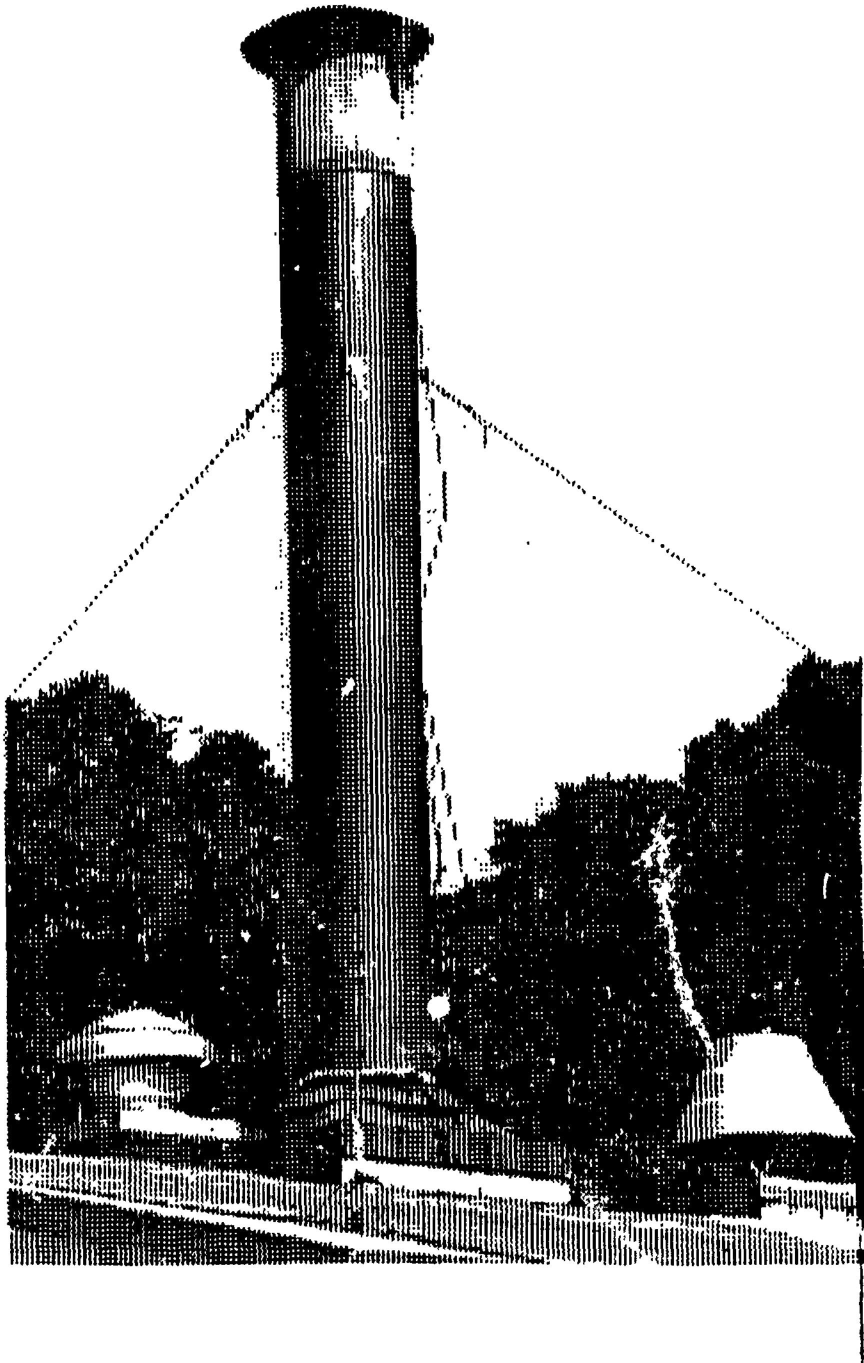

Figure 3. View of 400th MMS incinerator stack.

METHODS AND MATERIALS

EPA Methods 1 through 5 and 12 were used for the sampling and analysis during this project.

Two sampling ports were installed at right angles in the stack. Ports were approximately 4 duct-diameters downstream and 3 duct-diameters upstream from any flow disturbance.

The inside stack diameter at the sampling port location is 23.5 in. (59.7 cm). Based on the duct-diameter, port location and type of sampling required (particulate), a total of 24 traverse points were determined for source emission evaluation.

Samples were collected using the sampling train of EPA Method 5. The train consisted of a button-hook probe nozzle, heated probe with stainless steel liner, a paper filter in a glass filter holder, impingers and pumping and metering device. Flue gas velocity pressure was measured at the nozzle tip using a Type-S pitot tube connected to a 10-in. inclined-vertical manometer. Type K thermocouples were used to measure flue gas as well as sampling train temperatures.

Prior to sampling, cyclonic flow was determined by using the Type S pitot tube and measuring the stack gas rotational angle at each traverse point. Flow conditions were considered acceptable since the arithmetic average of the rotational angles was less than 20°. A preliminary velocity pressure traverse was also accomplished at this time.

The total time for sampling run 1 was 60 min with sampling time for each traverse point at 2.5 min. Runs 2 and 3 had sampling times of 72 min with 3 min, respectively, for each sampling point.

A grab sample for Orsat analysis (measures oxygen and carbon dioxide for stack gas molecular weight determination) was taken during each sample run (1). Collected emission data and Orsat analysis data are in Appendix B. Calibration data are contained in Appendix C (3).

The emission calculations in Appendix B are made using "Source Testing Calculation and Check Programs for Hewlett-Packard 41 Calculators" developed by the EPA's Office of Air Quality Planning and Standards (4).

RESULTS AND DISCUSSION

Field Results

All 3 sampling runs were accomplished on 27 Sep 91. A summary of the field data from Appendix C is presented in Table 1.

The sampling time was modified after run 1 to draw a larger sample volume. A sample volume greater than 30 dscf is desirable and usually required for NSPS testing.

TABLE 1. FIELD DATA SUMMARY

Run #	Sampling Time (min.)	Meter Volume (dscf*)	Stack Flow Rate (dscfm*)	Isokinetics %	O_2/CO_2 %	Particulate Mass (mg)
1	60	28.708	1,041	101.5	13.3/5.6	2,170.3
2	72	35.900	1,130	97.6	13.9/5.2	958.5
3	72	40.042	1,290	95.3	13.2/5.7	1,346.0

* dscf is defined as dry standard cubic feet (1).
dscfm is defined as dry standard cubic feet per minute (1).

Isokinetics, which is the measure of the ratio sampling rate to the stack flow rate, is nominal for each run (3). The larger departure from 100% in runs two and three are not significant, and can be attributed to the increasing stack and ambient temperature as well as the rising atmospheric pressure associated with the departing typhoon Miriella.

Oxygen is slightly higher than required for excess air and may indicate too much ventilation or incomplete combustion.

A complete evaluation of the incinerator could not be accomplished without incinerator schematics and specifications; however, additional emission data (i.e., stack temperatures) from Appendix B with visual observations suggest that emissions are not adequately combusted.

Probe washes, impinger solutions, and blanks (7 samples) were left at Det 3, Armstrong Laboratory on 27 Sep 91. Samples were subsequently shipped to Armstrong Laboratory, Brooks AFB. Samples were received on 24 Oct 91 with the sample blank missing and the run 1 probe wash sample broken.

After gravimetric analysis to determine particulate concentrations, the samples were submitted for lead analysis to the Armstrong Laboratory, Occupational and Environmental Health Directorate, Analytical Services Division.

Analysis Results

All analyses were completed on 5 Dec 91. A summary of the laboratory results is presented in Table 2. The laboratory report is in Appendix D.

Particulate concentrations far exceed the allowable emissions of most states and those of the EPA's NSPS standard. Lead emissions are also high, but without an emission standard for comparison, the data cannot be adequately assessed. However, the data could be used within a dispersion model to determine ambient lead concentrations as well as deposition and accumulations in the surrounding area.

3. Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III, Stationary Source Specific Methods, U.S. Environmental Protection Agency, EPA-600/4-77-027-b, Research Triangle Park, North Carolina, December 1984.

4. Source Test Calculation and Check Programs for Hewlett-Packard 41 Calculators. U.S. Environmental Protection Agency, EPA-304/1-85-018, Research Triangle Park, North Carolina, May 1987.

TABLE 2. ANALYSIS SUMMARY

Run #	Particulate Emissions gr/dscf	Particulate Emissions mg/m^3	Lead Emissions gr/dscf	Lead Emissions mg/m^3
1*	1.167	2,670	0.0013	2.977
2	0.412	942.9	0.0013	2.931
3	0.519	1,187	0.0008	1.764
Average	0.700	1,600	0.0011	2.557

* The particulate emissions of run one have been corrected for the damaged sample. The lead emissions have not been corrected.

CONCLUSIONS AND RECOMMENDATIONS

The test results show the munitions incinerator at Kadena AB is not in compliance with the EPA or many states' particulate emission standards. Though there are no lead standards for incinerators, it is expected that new EPA regulations, as well as state regulatory agencies, will soon address incinerator lead emissions. In addition, the data in this report could be used in conjunction with other sampling which was performed concurrently and/or used in a dispersion model to give a more viable result.

Stack temperatures, oxygen values, and visual observations indicate incomplete combustion. Several alternatives exist to reduce these emissions. A secondary burner located at the base of the stack providing a chamber temperature between 1600-1800 °F would ensure more complete combustion. In addition, this approach would affect the excess air since more oxygen would be used for combustion, producing more carbon dioxide. It is questionable how much this modification would reduce emissions and whether the refractory could withstand these kinds of temperatures. Control equipment such as a wet scrubber is more expensive, but is guaranteed to reduce particulate emissions; a new incinerator is even more expensive, but may be more cost effective in the long term.

REFERENCES

1. "Standards of Performance for New Stationary Sources," Title 40, Part 60, Code of Federal Regulations, July 1, 1987.

2. "Alaska Air Quality Control Regulations," Title 18, Chapter 50, Alaska Administrative Code, June 2, 1988.

APPENDIX A

PERSONNEL

PERSONNEL

Armstrong Laboratory Stack Pack

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Maj Ramon Cintron-Ocasio
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Det 3, Armstrong Laboratory
APO San Francisco 96239-5000

Phone: DSN 315-634-1769

APPENDIX B

FIELD DATA

PRELIMINARY SURVEY DATA SHEET NO. 1
(Stack Geometry)

BASE: Kadena AFB	PLANT: Munitions Incinerator
DATE: 27 Sept 91	SAMPLING TEAM: Maj Cintron / Capt Scott
SOURCE TYPE AND MAKE: Incinerator	
SOURCE NUMBER:	INSIDE STACK DIAMETER: 23.5" Inches
RELATED CAPACITY:	TYPE FUEL:
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER: 3.75" Inches	
NUMBER OF TRAVERSES: 2	NUMBER OF POINTS/TRAVERSE: 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL *(Inches)*	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT *(Inches)*
1			4.3
2			5.3
3			6.5
4			7.9
5			9.6
6			12.1
7			18.9
8			21.4
9			23.1
10			24.5
11			25.7
12			26.7

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PRELIMINARY SURVEY DATA SHEET No. 2
(Velocity and Temperature Traverse)

BASE Kadena AFB	DATE 27 Sept 91
BOILER NUMBER Munitions Incinerator	
INSIDE STACK DIAMETER 23.5"	Inches
STATION PRESSURE 29.950	In Hg
STACK STATIC PRESSURE - (0.07)	In H20
SAMPLING TEAM Major Cintron / Capt Scott	

TRAVERSE POINT NUMBER	VELOCITY HEAD, Vp IN H20	∡ $\sqrt{V_p}$	STACK TEMPERATURE (°F
1	0.015	0°	175
2	0.02	0°	202
3	0.02	0°	366
4	0.025	0°	434
5	0.03	0°	455
6	0.03	0°	461
7 (Static Pressure)	0.04	0°	472
8	0.035	0°	469
9	0.035	0°	467
10	0.04	0°	465
11	0.03	0°	463
12	0.03	0°	454
Moisture = 5%	Molecular weight Wet = 29.63		
CO_2 = 12%	" " Dry = 30.24		
O_2 = 8%	Average FPS = 12		
Cp = 0.84	Average Temp = 107°F		
Nozzle = 0.5741 (calculated)	DSCFM = 1,263		
	Δp =	0.03	
	AVERAGE		

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AI OLLUTION PARTICULATE ANALYTICA DATA

BASE	DATE	RUN NUMBER
Kadena AFB	28 Sept 91	R ~~an~~ 1

BUILDING NUMBER	SOURCE NUMBER
	Munitions Incinerator

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	1.4696	.2869	1.1727
ACETONE WASHINGS (Probe, Front Half Filter)	Broken in Shipment -		~~.7~~ .6807 ~~.4000~~ derived! Staff Date
BACK HALF (If needed)	99.1301	98.7532	0.3769
	Total Weight of Particulates Collected		~~1.9996~~ 2.1703 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	128.5	100	28.5
IMPINGER 2 (H20)	107.0	100	7
IMPINGER 3 (Dry)	.5		.5
IMPINGER 4 (Silica Gel)	209.9	200	9.9
	Total Weight of Water Collected		45.9 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	5.6	5.6	5.6		5.6
VOL % O_2	13.4	13.2	13.4		13.3
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

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PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: A-1

DATE: 28 Sept 91

PLANT: Munitions Incinerator

BASE: Kadena AFB

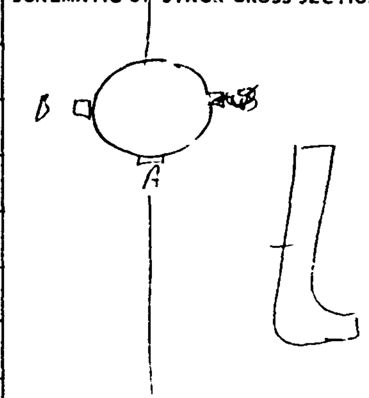
SAMPLE BOX NUMBER: 0. —

METER BOX NUMBER: 3551

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



EQUATIONS

$^{o}R = {^{o}F} + 460$

ΔH_o : 1.924

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

Prechecked vacuum = 15 psi

Post check =

Pitot check = no leak (pre-check)

Pitot check = (post-leak)

AMBIENT TEMP: 83 °F

STATION PRESS: 29.99 in Hg

HEATER BOX TEMP: 248° ±25 °F

PROBE HEATER SETTING: 248° ±25

PROBE LENGTH: 6' in

NOZZLE ~~AREA (A)~~ diameter: 050 in sq ft

Cp: 0.84

DRY GAS FRACTION (Fd): —

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20) Vacuum	STACK TEMP (°F) (3)	STACK TEMP (Ts) (°R)	ΔP VELOCITY HEAD (Vp) (4)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)(1)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)(2)	Filter SAMPLE BOX TEMP (°F)	Impinger IMPINGER OUTLET TEMP (°F)
1	2.5	1.0	240		0.015	0.77	401.465	87		87	246	74
2	2.5	1.5	305		0.015	0.71	3.17	94		90	248	63
3	2.5	2.0	295		0.015	0.72	4.30	96		90	249	60
4	2.5	2.5	399		0.015	0.64		97		91	249	59
5	2.5	3.0	496		0.02	0.76		97		91	251	58
6	2.5	4.0	512		0.025	0.94	405.0	97		91	250	57
7	2.5	4.5	532		0.03	1.10		97		91	249	57
8	2.5	5.0	538		0.03	1.10		97		91	252	57
9	2.5	5.0	540		0.025	0.91		98		92	252	57
10	2.5	5.0	538		0.025	0.92		98		92	252	58
11	2.5	5.5	540		0.025	0.91		98		92	252	59
12	2.5	6.0	530		0.025	0.92	416.986	99		92	252	59

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PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: B-1

DATE: 28 Sept 91

PLANT:

BASE: Kadena AFB

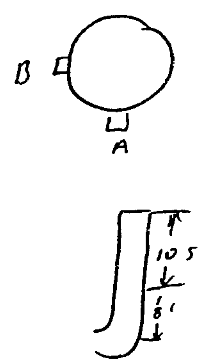
SAMPLE BOX NUMBER:

METER BOX NUMBER: 3551

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



EQUATIONS

$$^{o}R = {}^{o}F + 460$$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

AMBIENT TEMP: °F

STATION PRESS: in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: in

NOZZLE AREA (A): sq ft

Cp:

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	2.5	4.0	201		0.01	0.55	416.986	94		93	250	63
2	2.5	5.0	320		0.015	0.70		97		93	252	58
3	2.5	6.0	325		0.02	0.93		98		94	252	57
4	2.5	6.0	420		0.02	0.83		98		93	252	56
5	2.5	6.0	482		0.02	0.78		99		94	250	56
6	2.5	6.0	545		0.02	0.73		99		94	252	58
7	2.5	6.0	556		0.02	0.72		100		95	253	59
8	2.5	6.0	553		0.02	0.73		101		95	254	59
9	2.5	6.5	553		0.02	0.73		102		96	253	60
10	2.5	8.0	552		0.03	1.09		103		96	256	60
11	2.5	8.5	549		0.03	1.10		104		97	255	60
12	2.5	7.0	548		0.02	0.73	431.788	106		98	256	60
									96			
						0.84						
			461				$\boxed{30.32}$					
					$P_s T_s$ =	4.40		Temp Av = 96				

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AI OLLUTION PARTICULATE ANALYTIC/ DATA

BASE	DATE	RUN NUMBER
Kadena AFB, OK	28 Sept 91	2

BUILDING NUMBER	SOURCE NUMBER
Munitions Incinerator	

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	Ø.6652	.2937	Ø.3715
ACETONE WASHINGS (Probe, Front Half Filter)	105.8373	105.6039	Ø.2334
BACK HALF (If needed)	163.8432	103.4896	Ø.3536
	Total Weight of Particulates Collected		Ø.9585 gm

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	121	100	21
IMPINGER 2 (H20)	114	100	14
IMPINGER 3 (Dry)	20	—	20
IMPINGER 4 (Silica Gel)	217.8	200	17.8
	Total Weight of Water Collected		54.8 gm

III. GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	5.2	5.2	5.2		5.2
VOL % O_2	13.8	14.0	14.0		13.9
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

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PARTICULATE SAMPLING DATA SHEET

RUN NUMBER A-2	SCHEMATIC OF STACK CROSS SECTION	EQUATIONS	AMBIENT TEMP °F
DATE 28 Sept 91		$^{o}R = {^{o}F} + 460$	STATION PRESS in Hg
PLANT		$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$	HEATER BOX TEMP °F
BASE			PROBE HEATER SETTING
SAMPLE BOX NUMBER			PROBE LENGTH in
METER BOX NUMBER			NOZZLE AREA (A) sq ft
Qw/Qm			Cp
Co			DRY GAS FRACTION (Fd)

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	3 0	3 5	280		.02	1.00	456.359	105		103	248	63
2	3 0	4.0	400		.025	1.08		107		103	249	58
3	3 0	4 0	377		.02	0.89		109		103	251	58
4	3 0	4 0	460		.02	0.81		109		104	251	60
5	3.0	4 0	535		.02	0.75		110		104	251	60
6	3 0	4 0	560		.02	0.73		111		105	251	61
7	3 0	4 0	583		.02	0.72		111		105	249	62
8	3 0	4 0	587		.02	0.72		111		106	250	64
9	3.0	4 0	589		.02	0 71		111		106	251	64
10	3 0	4 0	575		.02	0.72		111		105	249	64
11	3 0	4.0	574		.02	0.72		111		106	250	66
12	3.0	4.0	565		.02	0.73	473.886	111		106	251	67
			Avg 494			1.03			105			
					$\sqrt{P_s T_s}$	= 4.9357						
							Vol = 38.53					

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PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: B-2

DATE: 28 Sept 91

PLANT:

BASE:

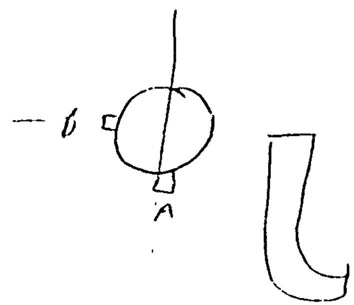
SAMPLE BOX NUMBER:

METER BOX NUMBER:

Qw/Qm:

Co:

SCHEMATIC OF STACK CROSS SECTION



EQUATIONS

$\Delta H_0 = 1.921$

$^{o}R = {}^{o}F + 460$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

AMBIENT TEMP: °F

STATION PRESS: 30.0 in Hg

HEATER BOX TEMP: °F

PROBE HEATER SETTING:

PROBE LENGTH: in

NOZZLE AREA (A): 0 5 sq ft

Cp: 0.84

DRY GAS FRACTION (Fd):

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F)(3)	STACK TEMP (Ts) (°K)	VELOCITY HEAD (Vp) (4)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F) (1)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F) (2)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	3.0	2 0	265		0.03	1.53	435.137	101		100	243	70
2	3 0	2.0	309		0 03	1.44		102		100	245	70
3	3 0	2 0	314		0 02	0.96		104		100	249	70
4	3 0	2 5	328		0 03	1.41		106		100	253	70
5	3 0	2.5	530		0 03	1 13		107		101	252	70
6	3 0	2.5	571		0.035	1.26		107		101	255	70
7	3 0	3 0	578		0.04	1.43		107		101	254	70
8	3 0	3 5	580		0.04	1.43		107		101	256	70
9	3 0	4 0	578		0.04	1 43		108		101	251	70
10	3 0	3.5	573		0 03	1.08		108		102	251	70
11	3 0	3.5	570		0 03	1.08		108		101	252	69
12	3 0	3 5	561		0 025	0.91	456.359	109		102	252	65

OEHL FORM MAY 78 18

AI. OLLUTION PARTICULATE ANALYTIC/ DATA

BASE	DATE	RUN NUMBER
		3

BUILDINC NUMBER	SOURCE NUMBER

I. PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	.9398	.2909	0.6489
ACETONE WASHINGS (Probe, Front Half Filter)	99.8668	99.4264	0.4404
BACK HALF (If needed)	94.7806	94.5239	0.2567
	Total Weight of Particulates Collected		1.3460 gm

.679

II. WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H20)	142	100	42
IMPINGER 2 (H20)	105	100	5
IMPINGER 3 (Dry)	10	—	1
IMPINGER 4 (Silica Gel)	212 8	200	12 8
	Total Weight of Water Collected		60 8 gm

III. GASES (Dry)

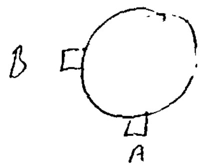
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO_2	5.6	5 8	5.8		5.7
VOL % O_2	13.2	13 2	13 2		13.2
VOL % CO					
VOL % N_2					

Vol % N_2 = (100% - % CO_2 - % O_2 - % CO)

OEHL FORM MAY 78 20

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER: A-3	SCHEMATIC OF STACK CROSS SECTION	EQUATIONS	AMBIENT TEMP: 88 °F °F
DATE: 28 Sept 91		$°R = °F + 460$	STATION PRESS: 30 in Hg
PLANT: Munitions		$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$	HEATER BOX TEMP: °F
BASE: Kadena			PROBE HEATER SETTING:
SAMPLE BOX NUMBER: -			PROBE LENGTH: in
METER BOX NUMBER: 3551			NOZZLE AREA (A): 0 5 sq ft
ΔH@: —			Cp: 0.84
Co: —			DRY GAS FRACTION (Fd): —



TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	3.0	2.5	368		0.02	1.02	474.259	106		105	244	70
2	3.0	4.0	425		0.03	1.63		106		106	244	60
	3.0	4.0	520		0.03	1.44		108		106	245	57
4	3.0	4.0	473		0.025	1.00		110		106	246	56
5	3.0	4.0	543		0.03	1.12		110		106	246	56
6	3.0	4.5	574		0.035	1.27		111		107	247	55
7	3.0	5.5	593		0.04	1.42		111		106	248	54
8	3.0	6.0	597		0.04	1.42		112		107	249	55
9	3.0	6.0	602		0.04	1.41		112		107	249	56
10	3.0	7.0	600		0.04	1.42		112		107	247	56
11	3.0	6.5	592		0.03	1.07		112		107	248	56
12	3.0	6.5	580		0.03	1.08	495.410	111		107	549	56

H

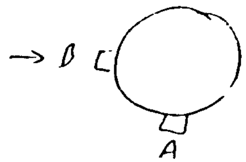
OEHL FORM 18 MAY 78

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER	SCHEMATIC OF STACK CROSS SECTION	EQUATIONS	AMBIENT TEMP
B-3			58 °F

- **RUN NUMBER:** B-3
- **DATE:** 28 Sept 91
- **PLANT:**
- **BASE:**
- **SAMPLE BOX NUMBER:**
- **METER BOX NUMBER:**
- **Qw/Qm:**
- **Co:**

SCHEMATIC OF STACK CROSS SECTION



EQUATIONS

$$^{o}R = {^{o}F} + 460$$

$$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co}\right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$$

- **AMBIENT TEMP:** 58 °F
- **STATION PRESS:** in Hg
- **HEATER BOX TEMP:** °F
- **PROBE HEATER SETTING:**
- **PROBE LENGTH:** in
- **NOZZLE AREA (A):** sq ft
- **Cp:**
- **DRY GAS FRACTION (Fd):**

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H20)	STACK TEMP (°F) ①	STACK TEMP (Ts) (°R)	VELOCITY ② HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN ③ (°F)	GAS METER TEMP AVG (Tm) (°R)	GAS METER TEMP OUT ④ (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	3.0	6.0	275		0.02	1.02	495.610	108		106	248	62
2	3.0	6.5	354		0.025	1.15		110		107	248	55
3	3.0	7.5	420		0.03	1.28		111		107	248	53
4	3.0	9.5	486		0.03	1.19		112		107	250	53
5	3.0	13.0	536		0.04	1.51		112		107	248	52
6	3.0	13.0	591		0.04	1.43		112		107	247	54
7	3.0	16.0	588		0.045	1.61		111		107	250	55
8	3.0	16.5	593		0.045	1.60		111		107	249	56
9	3.0	17.0	591		0.045	1.60		111		107	250	57
10	3.0	13.0	524		0.03	1.14		111		107	246	57
11	3.0	14.5	467		0.035	1.41		110		106	250	58
12	3.0	14.0	454		0.03	1.23		110		106	248	58
			Avg 494			1.31	517.539	Avg	109			

5.6398

$\sqrt{P_s T_s}$

Vol $\boxed{43.28}$

OEHL FORM MAY 78 18

```
                XPOM "METH 5"
RUN NUMBER
THREE
                         RUN
METER BOX Y?
            .9970        RUN
DELTA H?
          1.9240         RUN
BAR PRESS ?
           29.9000       RUN
METER VOL ?
           43.2800       RUN
MTR TEMP F?
          109.0000       RU
STATIC HOH IN ?
            -.0700       RUN
STACK TEMP.
          494.0000       RUN
                         RU
ML. WATER ?
           60.9000       RUN

% CO2?
          5.7000         RUN
% OXYGEN?
          13.2000        RUN
% CO ?
                         RUN

MWd =29.44
MW WET=28.68

SQRT PSTS ?
          5.6736         RUN
TIME MIN ?
          72.0000        RUN
NOZZLE DIA ?
            .5000        RUN
STK DIA INCH ?
          23.5000        RUN
                         RUN

* VOL MTR STD = 40.042
  STK PRES ABS = 29.99
  VOL HOH GAS = 2.96
  % MOISTURE = 6.67
  MOL DRY GAS = 0.973
  % NITROGEN = 81.10
  MOL WT DRY = 29.44
  MOL WT WET = 29.62
  VELOCITY FPS = 17.67
  STACK AREA = 7.01
  STACK ACFM = 2,503.
* STACK DSCFM = 1,298.
  % ISOKINETIC = 95.29

END OF FIELD DATA
```

```
                XPOM "METH 5"
RUN NUMBER
TWO
                         RUN
METER BOX Y?
            .9930        RUN
DELTA H?
          1.9240         RUN
BAR PRESS ?
           29.9000       RUN
METER VOL ?
           38.5700       RUN
MTR TEMP F?
          105.0000       RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                         RUN
STATIC HOH IN ?
            -.0700       RUN
STACK TEMP.
          494.0000       RUN
ML. WATER ?
           54.8000       RUN

% CO2?
          5.2001         RUN
% OXYGEN?
          13.9000        RUN
% CO ?
                         RUN
MOL WT OTHER?
                         RUN

MWd =29.39
MW WET=28.62

SQRT PSTS ?
          4.9357         RUN
TIME MIN ?
          72.0000        RUN
NOZZLE DIA ?
            .5000        RUN
STK DIA INCH ?
          23.5000        RUN

* VOL MTR STD = 35.908
  STK PRES ABS = 29.93
  VOL HOH GAS = 3.53
  % MOISTURE = 6.73
  MOL DRY GAS = 0.973
  % NITROGEN = 80.90
  MOL WT DRY = 29.39
  MOL WT WET = 28.62
  VELOCITY FPS = 12.13
  STACK AREA = 7.01
  STACK ACFM = 2,190.
* STACK DSCFM = 1,178.
  % ISOKINETIC = 97.56
```

```
                XPOM "METH 5"
RUN NUMBER
ONE
                         RUN
METER BOX Y?
            .9970        RUN
DELTA H?
          1.9240         RUN
BAR PRESS ?
           29.9000       RUN
METER VOL ?
           30.7200       RUN
MTR TEMP F?
           95.0000       RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ?
                         RUN
STATIC HOH IN ?
            -.0700       RUN
STACK TEMP.
          461.6000       RUN
ML. WATER ?
           45.9000       RUN

% CO2?
          5.5000         RUN
% OXYGEN?
          13.7000        RUN
% CO ?
                         RUN
MOL WT OTHER?
                         RUN

MWd =29.47
MW WET=28.67

SQRT PSTS ?
          4.4069         RUN
TIME MIN ?
          60.0000        RUN
NOZZLE DIA ?
            .5000        RUN
STK DIA INCH ?
          23.5000        RUN

* VOL MTR STD = 29.739
  STK PRES ABS = 29.93
  VOL HOH GAS = 2.15
  % MOISTURE = 7.08
  MOL DRY GAS = 0.930
  % NITROGEN = 81.10
  MOL WT DRY = 29.47
  MOL WT WET = 28.63
  VELOCITY FPS = 10.92
  STACK AREA = 7.01
  STACK ACFM = 1,955.
* STACK DSCFM = 1,041.
  % ISOKINETIC = 101.5-
```

```
XROM "MASSFLO"

RUN NUMBER
ONE
                     RUN

VOL MTR STD ?
        28.70300     RUN
STACK DSCFM ?
      1,041.00000    RUN
FRONT 1/2 MG ?
      2,170.30000    RUN
BACK 1/2 MG ?
                     RUN


F  GR/DSCF = 1.16665
F  MG/MMM = 2,669.70789
F  LB/HR = 10.40988
F  KG/HR = 4.72192
```

```
XROM "MASSFLO"

RUN NUMBER
TWO
                     RUN

VOL MTR STD ?
        35.90000     RUN
STACK DSCFM ?
      1,130.00000    RUN
FRONT 1/2 MG ?
         958.50000   RUN
BACK 1/2 MG ?
                     RUN


F  GR/DSCF = 0.41202
F  MG/MMM = 942.85429
F  LB/HR = 3.99075
F  KG/HR = 1.81020
```

```
XROM "MASSFLO"

RUN NUMBER
THREE
                     RUN

VOL MTR STD ?
        40.04200     RUN
STACK DSCFM ?
      1,290.00000    RUN
FRONT 1/2 MG ?
      1,346.00000    RUN
BACK 1/2 MG ?
                     RUN


F  GR/DSCF = 0.51875
F  MG/MMM = 1,187.06963
F  LB/HR = 5.73584
F  KG/HR = 2.60179
```

```
XROM "MASSFLO"

RUN NUMBER
ONE PB
                     RUN

VOL MTR STD ?
        28.70300     RUN
STACK DSCFM ?
      1,041.00000    RUN
FRONT 1/2 MG ?
         2.42000     RUN
BACK 1/2 MG ?
                     RUN


F  GR/DSCF = 0.00130
F  MG/MMM = 2.37687
F  LB/HR = 0.01161
F  KG/HR = 0.00527
```

```
XROM "MASSFLO"

RUN NUMBER
TWO PB
                     RUN

VOL MTR STD ?
        35.90000     RUN
STACK DSCFM ?
      1,130.00000    RUN
FRONT 1/2 MG ?
         2.98000     RUN
BACK 1/2 MG ?
                     RUN


F  GR/DSCF = 0.00126
F  MG/MMM = 2.93136
F  LB/HR = 0.01241
F  KG/HR = 0.00563
```

```
XROM "MASSFLO"

RUN NUMBER
THREE PB
                     RUN

VOL MTR STD ?
        40.04200     RUN
STACK DSCFM ?
      1,290.00000    RUN
FRONT 1/2 MG ?
         2.00000     RUN
BACK 1/2 MG ?
                     RUN


F  GR/DSCF = 0.00077
F  MG/MMM = 1.76395
F  LB/HR = 0.00953
F  KG/HR = 0.00387
```

APPENDIX C

CALIBRATION DATA

NOZZLE CALIBRATION DATA FORM

Date ______________________ Calibrated by ______________________

Nozzle identification number	Nozzle Diameter[a] D_1, mm (in.)	D_2, mm (in.)	D_3, mm (in.)	ΔD,[b] mm (in.)	D_{avg}[c]
	0.500	0.500	0.500	0	0

where:

[a] $D_{1,2,3,}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

[b] ΔD = maximum difference between any two diameters, mm (in.), $\Delta D \leq$(0.10 mm) 0.004 in.

[c] D_{avg} = average of D_1, D_2, and D_3.

$\frac{32 cf}{24}$ = 1.33 cf/point

~~12 fps $\left(\frac{0.50}{12}\right)^2$ = 0.79 cf/s = $\frac{117.8}{24}$ = 4.~~

cf

$\left(\pi\left(\frac{0.5/2}{12}\right)^2 \times 12\right) \times 60 \times 2.5$ = 2.45 cf/point (58.8 cf)

$\left(\pi\left(\frac{0.6/2}{12}\right)^2 \times 12\right) \times 60 \times 2.5$ = 3.53 cf/point

(3.236) × 24 = $\boxed{77.65}$

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Primary Standard calibrated 19 July 90

Date 13 Aug 90 Vac = 5.Ø Meter box number Nutech 2

Barometric pressure, P_b = 30.12 in. Hg Calibrated by Scott & Vaughn

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Avg[a] (t_d), °F	Time (Θ), min	Y_i	$\Delta H@_i$ in. H_2O
0.5	5	4.984	79 85 542.Ø	79 88 543.5	76 81 538.5	541.Ø	13.1	1.ØØØ1	~~[illegible]~~ 1.948
1.0	5	5.ØØ6	83 82 543.5	88 89 548.5	81 81 541.Ø	544.75	9.2	Ø.9987	1.932
1.5	10	10.Ø8Ø	82 82 542.Ø	89 94 551.5	81 84 542.5	547.Ø	15.Ø	Ø.9976	1.908
2.0	10	10.225	82 83 542.5	94 97 555.5	84 86 545	550.25	13.1	0.9871	1.932
3.0	10	10.175	83 83 543.Ø	97 100 558.5	86 88 547	552.75	10.7	0.9932	1.928
Vac = 7Ø 4.0	10	10.28Ø	83 83 543.Ø	100 100 560	89 89 549	554.5	9.2	Ø.9838	1.8947
							Avg	Ø.993	1.924

.999 1.969

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460) \Theta}{V_w} \right]^2$
0.5	0.0368	$Y_i = \frac{(5)(30.12)(541)}{(4.984)(30.1568)(542.0)}$	$= \frac{(.0317)(.5)}{(30.12)(541)} \left[\frac{(542)(13.1)}{(5)} \right]^2 = 1.948$
1.0	0.0737	$Y_i = \frac{(5)(30.12)(544.75)}{(5.006)(30.1937)(543.5)}$	$\frac{(.0317)(1.0)}{(30.12)(544.8)} \left[\frac{(543.5)(9.2)}{5} \right]^2 = 1.932$
1.5	0.110	$Y_i = \frac{(10)(30.12)(547.0)}{(10.08)(30.230)(542.0)}$	$\frac{(.0317)(1.5)}{(30.12)(547)} \left[\frac{(542)(15)}{(10)} \right]^2 = 1.9076$
2.0	0.147	$= \frac{(10)(30.12)(550.25)}{(10.225)(30.267)(542.5)}$	$\frac{(.0317)(2.0)}{(30.12)(550.75)} \left[\frac{(542.5)(13.1)}{10} \right]^2 = 1.9326$
3.0	0.221	$= \frac{(10)(30.12)(552.75)}{(10.175)(30.341)(543.0)}$	$\frac{(.0317)(3.0)}{(30.12)(552.75)} \left[\frac{(543)(10.7)}{10} \right]^2 = 1.9283$
4.0	0.294	$= \frac{(10)(30.12)(554.5)}{(10.28)(30.414)(543)}$	$\frac{(.0317)(4)}{(30.12)(554.5)} \left[\frac{(543)(9.2)}{10} \right]^2$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

Quality Assurance Handbook M4-2.3A (front side)

—p/7

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 23 Dec 91 Meter box number 2

Barometric pressure, P_b = 29.370 in. Hg Calibrated by O'Brien/Vaughn

	Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Avg[a] (t_d), °F	Time (Θ), min	Y_i	$\Delta H@_i$ in. H_2O
VAC										
4.8	0.5	5	4.451	69 70 69.5	70 73 71.5	69 70 69.5	70.5	12.642	1.011	1.823
4.8	1.0	5	4.904	70 71 70.5	73 76 74.5	70 70 70	72.25	9.059	1.020	1.886
4.8	1.5	10	9.754	71 71 71	76 82 79	70 72 71	75	15.054	1.029	1.934
4.9	2.0	10	9.825	71 71 71	88 91 89.5	77 79 78	83.75	13.19	1.037	1.947
5.1	3.0	10	9.867	71 71 71	85 88 86.5	74 77 75.5	81	10.750	1.025	1.950
7.0	4.0	10	9.79	71 71 71	91 96 93.5	79 82 80.5	87	9.251	1.042	1.905
								Avg	1.027	1.908

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \frac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\Theta}{V_w}\right]^2$
0.5	0.0368	$\frac{(5)(29.370)(70.5+460)}{(4.951)(29.370+\frac{.5}{13.6})(69.5+460)}$	$\frac{0.0317(.5)}{29.370(70.5+460)}\left[\frac{(69.5+460)(12.642)}{5}\right]^2$
1.0	0.0737	$\frac{(5)(29.370)(72.25+460)}{(4.904)(29.370+\frac{1.0}{13.6})(70.5+460)}$	$\frac{0.0317(1.0)}{29.370(72.25+460)}\left[\frac{(70.5+460)(9.059)}{5}\right]^2$
1.5	0.110	$\frac{(10)(29.370)(75+460)}{(9.754)(29.370+\frac{1.5}{13.6})(71+460)}$	$\frac{0.0317(1.5)}{29.370(75+460)}\left[\frac{(71+460)(15.054)}{10}\right]^2$
2.0	0.147	$\frac{(10)(29.370)(83.75+460)}{(9.825)(29.370+\frac{2.0}{13.6})(71+460)}$	$\frac{0.0317(2.0)}{29.370(83.75+460)}\left[\frac{(71+460)(13.19)}{10}\right]^2$
3.0	0.221	$\frac{(10)(29.370)(81+460)}{(9.867)(29.370+\frac{3.0}{13.6})(71+460)}$	$\frac{0.0317(3.0)}{29.370(81+460)}\left[\frac{(71+460)(10.750)}{10}\right]^2$
4.0	0.294	$\frac{(10)(29.370)(87+460)}{(9.79)(29.370+\frac{4.0}{13.6})(71+460)}$	$\frac{0.0317(4.0)}{29.370(87+460)}\left[\frac{(71+460)(9.251)}{10}\right]^2$

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

APPENDIX D

LABORATORY REPORT

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GN910025 OEHL SAMPLE NO: 91061451

SAMPLE TYPE: NON-POTABLE WATER

SITE IDENTIFIER: FAMU227 DATE RECEIVED: 911126

DATE COLLECTED: 910928 DATE REPORTED: 911211

DATE REPRINTED: 920102

SAMPLE SUBMITTED BY: 18 MEDICAL GROUP/SGPB

RESULTS

Test	Results	Units
Lead	9669	ug/L

Analyzed by:

Aaron L. Forrest, Sgt, USAF
Occupational Analysis Technician

Reviewed by:

G. Cornell Long
Chief, Metals Analysis Function

TO:

AL/OEBE
BROOKS AFB TX 78235-5000

AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE
BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GN910026 OEHL SAMPLE NO: 91061452

SAMPLE TYPE: NON-POTABLE WATER

SITE IDENTIFIER: FAMU227 DATE RECEIVED: 911126

DATE COLLECTED: 910928 DATE REPORTED: 911211

DATE REPRINTED: 920102

SAMPLE SUBMITTED BY: 18 MEDICAL GROUP/SGPB

RESULTS

Test	Results	Units
Lead	2879	ug/L

Analyzed by: Aaron L Forrest

Aaron L. Forrest, Sgt, USAF
Occupational Analysis Technician

Reviewed by: G. Cornell Long

G. Cornell Long
Chief, Metals Analysis Function

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BROOKS AFB TX 78235-5000

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REPORT OF ANALYSIS

BASE SAMPLE NO: GN910027 OEHL SAMPLE NO: 91061453

SAMPLE TYPE: NON-POTABLE WATER

SITE IDENTIFIER: FAMU227 DATE RECEIVED: 911126

DATE COLLECTED: 910928 DATE REPORTED: 911211

DATE REPRINTED: 920102

SAMPLE SUBMITTED BY: 18 MEDICAL GROUP/SGPB

RESULTS

Test	Results	Units
Lead	1661	ug/L

Analyzed by: Aaron L Forrest

Aaron L. Forrest, Sgt, USAF
Occupational Analysis Technician

Reviewed by: G. Cornell Long

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Chief, Metals Analysis Function

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BROOKS AFB, TEXAS, 78235-5000

REPORT OF ANALYSIS

BASE SAMPLE NO: GN910028 OEHL SAMPLE NO: 91061454

SAMPLE TYPE: NON-POTABLE WATER

SITE IDENTIFIER: FAMU227 DATE RECEIVED: 911126

DATE COLLECTED: 910928 DATE REPORTED: 911211

DATE REPRINTED: 920102

SAMPLE SUBMITTED BY: 18 MEDICAL GROUP/SGPB

RESULTS

Test	Results	Units
Lead	9059	ug/L

Analyzed by: Aaron L Forrest

Aaron L. Forrest, Sgt, USAF
Occupational Analysis Technician

Reviewed by: G. Cornell Long

G. Cornell Long
Chief, Metals Analysis Function

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REPORT OF ANALYSIS

BASE SAMPLE NO: GN910029 OEHL SAMPLE NO: 91061455

SAMPLE TYPE: NON-POTABLE WATER

SITE IDENTIFIER: FAMU227 DATE RECEIVED: 911126

DATE COLLECTED: 910928 DATE REPORTED: 911211

DATE REPRINTED: 920102

SAMPLE SUBMITTED BY: 18 MEDICAL GROUP/SGPB

RESULTS

Test	Results	Units
Lead	6995	ug/L

Analyzed by:

Aaron L. Forrest, Sgt, USAF
Occupational Analysis Technician

Reviewed by:

G. Cornell Long
Chief, Metals Analysis Function

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